REMARKS/ARGUMENTS

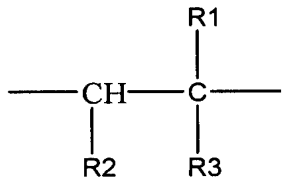
Applicants wish to thank Examiner Mesh and Supervisory Examiner Jagannathan for the helpful discussion on October 10, 2007. The claims as amended and the arguments presented below were discussed.

It was noted that the double patenting rejection over the claims of US 7,001,967 should be withdrawn because Claims 1-4 of US 7,001,967 do not claim that R6 and R10 are each hydrogen. The structures are simply different. In fact, Claims 1 and 4 of US 7,001,967 claim that if at least one of R6 and R10 is hydrogen then the other should not be hydrogen. Thus, the claims of US '967 actually teach away from having R6 and R10 be both hydrogen at the same time.

The present invention as set forth in **Claim 3** relates to an **optical film exhibiting negative birefringence**, which comprises:

a resin composition, which comprises:

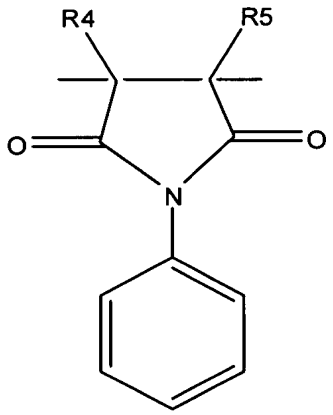
(a) 30-95% by weight of a copolymer comprising an α-olefin residual group unit represented by the following formula (i):



(i)

wherein R1, R2 and R3 each independently represent hydrogen or an alkyl group having 1-6 carbon atoms, and

an N-phenyl-substituted maleimide residual group unit represented by the following formula (ii):



(ii)

wherein R4 and R5 each independently represent hydrogen, or a linear or branched alkyl group having 1-8 carbon atoms; and having a weight average molecular weight, as reduced into standard polystyrene, of 5×10^3 to 5×10^6; and

(b) 70-5% by weight of at least one acrylonitrile-styrene based copolymer selected from an acrylonitrile-styrene copolymer and an acrylonitrile-butadiene-styrene copolymer, a weight ratio of an acrylonitrile residual group unit to a styrene residual group unit being 20/80 to 35/65, and having a weight average molecular weight, as reduced into standard polystyrene, of 5×10^3 to 5×10^6;

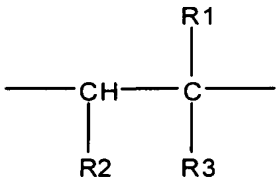
the optical film being obtained by uniaxially stretching the resin composition,

the optical film having a relationship of three-dimensional refractive indexes of nz≥ny>nx or ny≥nz>nx in the case where the stretching direction within a film plane is defined as an x-axis, a direction within a film plane is perpendicular to the x-axis and is defined as a y-axis, a direction outside the film plane and perpendicular to the stretching direction is defined as a z-axis, a refractive index in the x-axis direction is defined as nx, a refractive index in the y-axis direction is defined as ny, and a refractive index in the z-axis direction is defined as nz.

Claim 17 relates to an **optical film exhibiting negative birefringence**, which comprises:

a resin composition, which comprises:

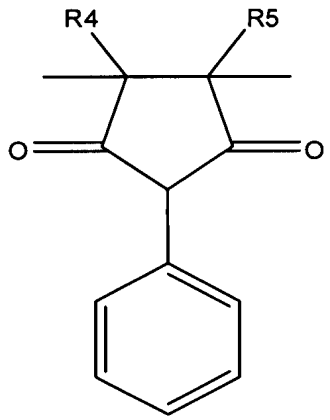
(a) 30-95% by weight of a copolymer comprising an a-olefin residual group unit represented by the following formula (i):



(i)

wherein R1, R2 and R3 each independently represent hydrogen or an alkyl group having 1-6 carbon atoms, and

an N-phenyl-substituted maleimide residual group unit represented by the following formula (ii):



(ii)

wherein R4 and R5 each independently represent hydrogen, or a linear or branched alkyl group having 1-8 carbon atoms; and

having a weight average molecular weight, as reduced into standard polystyrene, of 5×10^3 to 5×10^6; and

(b) 70-5% by weight of at least one acrylonitrile-styrene based copolymer selected from an acrylonitrile-styrene copolymer and an acrylonitrile-butadiene-styrene

copolymer, a weight ratio of an acrylonitrile residual group unit to a styrene residual group unit being 20/80 to 35/65, and having a weight average molecular weight, as reduced into standard polystyrene, of 5×10^3 to 5×10^6,

the optical film being obtained by biaxially stretching the resin composition,

the optical film having a relationship of three-dimensional refractive indexes of nz>ny≥nx or nz>nx≥ny in the case where the stretching direction is define as an x-axis and a y-axis within a film plane, a direction outside the film plane and perpendicular to the x-axis and y-axis is defined as a z-axis, a refractive index in the x axis direction is defined as nx, a refractive index in the y-axis direction is defined as ny, and a refractive index in the z-axis direction is defined as nz.

The double patenting rejection of Claims 3-4, 10-12 and 15-19 over claims 1-4 of US 7,001,967, in view of paragraphs [004 and 005] of the specification, and in further view of Arakawa et al is traversed.

The Examiner's statement, that "among the two components constituting the invention of the present application, the first component (copolymer (a)) is described in U.S. Patent No. 7,001,967", is erroneous.

The "copolymer of specific olefin and N-phenyl substituted maleimide" of the present application and the "copolymer of specific olefin and N-phenyl-substituted maleimide" described in U.S. 7,001,967 are different (in U.S. 7,001,967, at least either one of R6 and R10 is other than hydrogen). Thus, none of two components is described in U.S. 7,001,967.

Claims 1-4 of US 7,001,967 do not claim that R6 and R10 are each hydrogen. The structures are simply different. In fact, Claims 1 and 4 of US 7,001,967 claim that if at least

one of R6 and R10 is hydrogen then the other should not be hydrogen. Thus, the claims of US '967 actually teach away from having R6 and R10 be both hydrogen at the same time.

Arakawa et al disclose only the use of styrene/acrylonitrile copolymer and fail to disclose the use of component a). As such, even if the claims of US 7,001,967 are combined with Arakawa et al, component a) is not disclosed.

Further, U.S. 7,001,967 does not describe a combination with an acrylonitrile-styrene based copolymer (second component).

Therefore, U.S. 7,001,967 describes neither of the first component and the second component, constituting the optical film of the invention of the present application.

Arakawa et al disclose that a uniaxially stretched film of a styrene-acrylonitrile copolymer exhibits negative birefringence. It also discloses blending another polymer with a styrene-acrylonitrile copolymer. However, Arakawa et al neither dicloses nor suggests blending an olefin-N-phenylmaleimide copolymer with a styrene-acrylonitrile copolymer. As such, even if the claims of US 7,001,967 are combined with Arakawa et al, components a) and b) in combination are not disclosed.

In addition, the optical film having negative birefringence, and satisfying the relation among the three-dimensional refractive indexes of $nz \geq ny > nx$ or $ny \geq nz > nx$ by uniaxial stretching, or $nz > ny \geq nx$ or $nz > nx \geq ny$ by biaxial stretching according to the present invention is neither described nor suggested at all in Arakawa et al.

The relation of the three-dimensional birefringence as set forth in column 5, lines 40 to 60 of Arakawa et al relates to **positive birefringence**, which is not describing a uniaxially stretched film comprising a styrene-acrylonitrile copolymer.

Also the negative birefringence featuring the optical film of the present application is developed by combining the specified olefin-N-phenylmaleimide copolymer and the acrylonitrile-styrene copolymer. However, this is not a function inherent to the substance itself but a secondary function developed by an alignment of the polymer chains. Also the relationship of the three-dimensional refractive indexes is a parameter controllable by the alignment condition of the polymer chain (for example stretching condition), and is also a parameter determining the characteristics as the optical film. Therefore, also in the invention of the present application, different relationships of the three-dimensional refractive indexes are defined respectively for the uniaxial stretching and the bi-axial stretching.

Further, one cannot easily switch between positive and negative birefringence depending on how stretching occurs. According to the discussion at pages 1 and 2 of the specification this is not possible since negative birefringence films have not been available so far.

In this context, the specification states at pages 1 and 2 that hitherto, stretching and orientation of films have been carried out as a method of revealing optical anisotropy (positive or negative birefringence) of transparent resin materials. It is known that according to the stretching and orientation, films made of polymethyl methacrylate (PMMA) or polystyrene (PS) exhibit negative birefringence, whereas films made of a polycarbonate (PC) or an amorphous cyclic polyolefin (APO) exhibit positive birefringence.

However, PMMA and PS were limited with respect to applications because they have

a glass transition temperature (hereinafter referred to as "Tg") in the vicinity of 100°C so that the heat resistance is insufficient, and are brittle. On the other hand, although PC and APO have a Tg of around 140°C so that they are excellent in heat resistance and dynamic characteristic, they are a material exhibiting positive birefringence but not a material exhibiting negative birefringence, which exhibits transparent and heat resistance and is dynamically excellent. Accordingly, it is the present state that optical films are wholly produced using a resin material exhibiting positive birefringence and that heat resistant optical films exhibiting negative birefringence are not available yet.

In summary, because the positive or negative birefringence of the films is a function of the orientation of the molecular chains and is developed by stretching the resins, one cannot easily switch between negative and positive birefringence simply by controlling the stretching. The actual molecular structure that is stretched also contributes. Similarly, obtaining a specific relation of the three-dimensional refractive indices is not a simple matter. A specific film having specific molecules gives a specific relationship of three-dimensional refractive indices when stretched.

Also blending of different materials does not simply result in a material having negative birefringence and the claimed three-dimensional relationship of the refractive indices.

The Examiner is reminded that even if there was a prima facie case (which there is not as stated above), unexpected results can be used to rebut such prima facie case. Accordingly, optical films of the present invention having the claimed combination of components a) and b) in the claimed amounts do not exhibit fine cracks and can therefore be used as retardation films. See Examples 1-5 at pages 20 -25 of the specification.

In contrast, Comparative Examples 1-3 use **only component a)** (N-phenylmaleimide-isobutene copolymer and N-(2-methylphenyl)maleimide-isobutene copolymer, respectively in Comparative Examples 1 and 2) **or only component b)** (acrylonitrile-styrene copolymer in Comparative Example 3). **The resulting film have cracks and are brittle or have inferior heat resistance.** See pages 25-28 of the specification. Thus, any prima facie case has been rebutted.

Further, Applicants disagree with the Examiner's representation of what is disclosed in paragraphs [004 and 005] of the specification. Contrary to the Examiner's statements, these paragraphs relate to **background art** and describe the **drawbacks** of using PMMA and PS which have **insufficient heat resistance and are brittle** or of APO which exhibits **positive** birefiringence. **There is no disclosure or suggestion of the combination of components a) and b) as claimed in the claimed amounts to produce an optical film having negative birefringence or the claimed relation among the three-dimensional refractive indexes.**

Thus, the double patenting rejection of Claims 3-4, 10-12 and 15-19 over claims 1-4 of US 7,001,967, in view of paragraphs [004 and 005] of the specification, and in further view of Arakawa et al should be withdrawn.

The rejection of Claims 3-4, 10-12 and 15-19 under 35 U.S.C. § 103(a) over JP 05-117334 and Arakawa et al is traversed.

JP 05-117334 and Arakawa et al fail to disclose or suggest an optical film exhibiting negative birefringence as claimed comprising components a) and b) in the claimed amounts and the claimed relation among the three-dimensional refractive indexes.

In addition, JP 05-117334 and Arakawa et al fail to disclose or suggest the superior properties obtained with the claimed film.

JP-05-117334 discloses an **olefin/ N-phenyl substituted maleimide/ N-alkyl substituted maleimide copolymer** and an optical material comprising the copolymer. The optical material exhibits **low** birefringence (JP 05-117334, abstract). However, **low** birefringence is **different from negative** birefringence. Such optical materials cannot be used as optical films which positively make use of birefringence represented by a retardation film because of their characteristic low birefringence.

However, the low birefringence and the negative birefringence are completely different optical characteristics. JP-05-117334 describes blending or copolymerizing a material having a positive birefringence and a material having a negative birefringence **to cancel the birefringence** [paragraphs 0022 and 0026] thereby obtaining a material of a low birefringence. There is no disclosure of obtaining a material having positive birefringence or negative birefringence. JP 05-117334 aims at providing a material of a low birefringence and is fundamentally contradictory to the invention of present application which intends to provide an optical film positively utilizing the birefringence.

Also Example 5 describes that an N-phenylmaleimide-isobutene copolymer has an optoelastic coefficient of $+30 \times 10^{12}$ (cm^2/dyne), but such optoelastic coefficient is indicated as an index for ease of development of the birefringence, and it is clear from Comparative Example of the invention of the present application and from U.S. 7,001,967 that the film obtained from such copolymer exhibits positive birefringence.

Besides, the copolymer or maleimide type compound described in Example 2, pointed out by the Examiner to describe negative birefringence and a negative optoelastic

coefficiency, is different from the copolymer (a) (first component) of the invention of present application.

Furthermore, JP05-117334 does not describe nor suggest to form an optical film exhibiting negative birefringence by blending with AS or with another resin, and does not describe nor suggest to form an optical film showing negative birefringence and having a particular characteristics in a relationship of three-dimensional refractive indexes of $nz \geq ny > nx$ or $ny \geq nz > nx$, or $nz > \geq ny \geq nx$ or $nz > nx \geq ny$.

Also, the film formed by the resin described in JP05-117334 is just the one, described in Comparative Examples 1 and 2 of the specification of the present application, as being brittle.

JP 05-117334 neither discloses nor suggests not only blending with AS but also the specific characteristics that the relationship among three-dimensional refractive indexes satisfies $nz \geqq ny > nx$ or $ny \geqq nz > nx$, or $nz > ny \geqq nx$ or $nz > nx \geqq ny$.

JP 05-117334 describes, in Examples 1 and 2, resins having a negative optoelectric coefficient, but these resins are different from the component (a) constituting the invention of the present application. (In addition, an N-(2-methylphenyl)maleimide-isobutene copolymer described in Example 2 is a resin, that was described, in Comparative Example 2 in the specification of the invention of the present application, to generate fine cracks when employed singly.) Also a resin, corresponding to the component (a) of the construction of the invention of the present application, is described in Example 5 as having a positive optoelastic coefficient.

Arakawa et al disclose only the use of styrene/acrylonitrile copolymer and fail to disclose the use of component a). Arakawa et al disclose that a uniaxially stretched film of a styrene-acrylonitrile copolymer exhibits negative birefringence. Arakawa et al neither dicloses nor suggests blending an olefin-N-phenylmaleimide copolymer with a styrene-acrylonitrile copolymer.

In addition, the optical film having negative birefringence, and satisfying the relation among the three-dimensional refractive indexes of $nz \geq ny > nx$ or $ny \geq nz > nx$, or $nz > ny \geq nx$ or $nz > nx \geq ny$ according to the invention of the present application is neither described nor suggested at all in Arakawa et al.

The relation of the three-dimensional birefringence as set forth in column 5, lines 40 to 60 of Arakawa et al relates to **positive birefringence**, which is not describing a uniaxially stretched film comprising a styrene-acrylonitrile copolymer.

Arakawa et al merely disclose a film which has a negative birefringence but is inferior in the thermal resistance, as described in Comparative Example 3 of the specification of the present application which has **only component b)** (acrylonitrile-styrene copolymer in Comparative Example 3). **The resulting films have cracks and are brittle or have inferior heat resistance.**

JP 05-117334 and Arakawa et al fail to disclose or suggest an optical film exhibiting negative birefringence as claimed comprising components a) and b) in the claimed amounts and the claimed relation among the three-dimensional refractive indexes.

The optical film of the invention of the present application, does not have cracks, is not brittle and exhibits excellent heat resistance. For example the specification discloses at page 18, lines 19-24:

> "The resin composition for optical film according to the present invention is a resin composition having excellent heat resistance and dynamic characteristics and having excellent characteristics as a composition for optical films exhibiting negative birefringence, and an optical film comprising the same is excellent in heat resistance and dynamic characteristics and can be suitably used for optical films required to have negative birefringence."

The claimed films having the combination of components a) and b) in the claimed amounts do not exhibit fine cracks and can therefore be used as retardation films. See Examples 1-5 at pages 20 -25 of the specification.

In contrast, Comparative Examples 1-3 use **only component a)** (N-phenylmaleimide-isobutene copolymer and N-(2-methylphenyl)maleimide-isobutene copolymer, respectively in Comparative Examples 1 and 2) **or only component b)** (acrylonitrile-styrene copolymer in Comparative Example 3). **The resulting film have cracks and are brittle or have inferior heat resistance.** See pages 25-28 of the specification. These superior properties are not disclosed or suggested by JP 05-117334 and Arakawa et al, alone or in **combination**. Thus, even a **combination** of JP 05-117334 and Arakawa et al does **not** render the present invention obvious.

Also, the Examiner states that it is obvious to those skilled in the art to combine the description of JP05-117334 and the description of U.S. 5,213,852, but, as already described above, JP05-117334 is to provide a material of low birefringence and is to eliminate the birefringence. On the other hand U.S. 5,213,852 is to develop and to positively utilize the birefringence, and the combination of such mutually contradicting characteristics cannot be

easily conceived even by those skilled in the art. Furthermore, the invention of present application solves, at the same time, the problems of brittleness and low heat resistance.

Regarding **claims 17-19**, in the optical film of the invention of the present application, the controllability of the relationship of three-dimensional refractive indexes by the stretching condition (changing by the stretching condition) is evident by the comparison of claim 3 with claim 17 and by the comparison of Examples 1 and 4 with Example 5, and such control is more difficult than the development of the negative birefringence and not obvious in view of JP 05-117334 and Arakawa et al.

Therefore, rejection of Claims 3-4, 10-12 and 15-19 under 35 U.S.C. § 103(a) over JP 05-117334 and Arakawa et al are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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